NASA Administrator
Daniel S. Goldin

Emerging Issues Forum
Raleigh, NC
February 26, 1998

That video is the NASA version of last week's Wolfpack-Tar Heels basketball game packed into 60 seconds.

It showed a lot of what we did in 1997.

The downside is that 60 short seconds of video does not do justice to the talented women and men at NASA who made such a great year possible.

Before I begin, I'd like to thank Governor Jim Hunt.

There was an editorial in yesterday's "Washington Post" that described Governor Hunt as a "pace-setter."

I think this annual forum is proof of that. And I'm glad to be here in Raleigh -- at the Governor's alma mater -- to participate.

Today, I'd like to talk about how we can work together to better understand the partnership between our people and our planet. But first, I'd like to tell a story about a trip to Maine I was on not too long ago.

I sat through a fascinating lecture -- a presentation, really -- on remote sensing.

The researchers delivering the presentation were using the Internet to pull down the latest images from a NASA Landsat satellite.

Then, the lead researcher analyzed the images and told me, in no uncertain terms, exactly what the images and data told us about central Maine's ecosystem and land use.

He was by all counts an expert in the field of remote sensing.

He had tremendous poise and confidence.

He was also in the third grade -- a skinny little fellow with horn-rimmed glasses.

And his colleagues -- the other distinguished researchers? Also only about nine years old.

It was mind-boggling. I mean, think about it . . . a classroom full of nine year-old experts on satellite imagery and remote sensing.

Here were young people taking the future in their own hands.

They were using the latest technology to understand the relationship of the global environment to their small community and to help local farmers.

I know about Governor Hunt's commitment to and this state's tradition of research and education.
So I know there are children here in North Carolina who are participating in the same kind of projects.

In fact, there were middle school students from North Carolina who participated in a project on the last Shuttle mission, STS-89, called EarthKam.

This project allowed the students to operate a digital camera mounted on the Shuttle and pick sites around the world to be photographed.

And then like the students in Maine, they could pull these images off the Internet and analyze things like fault lines and coastline properties.

Seeing these kids work is inspiring. It gives one hope for the future.

And it also brings me to the point I want to make. It has become a cliché, but is nevertheless true:

Think globally . . . act locally.

To do that we can't afford to look through a narrow lens and use only that perspective
to analyze information and ultimately make decisions.

Sometimes, we must step back and take a broader view . . . look at the whole picture.

Let me give you an example of what I mean -- an example that will set the context
for the rest of our discussion today -- and also answer the questions:

"Why NASA?" "What do Mir and Mars have to do with the environment in North Carolina?"

If we look through a narrow lens, space travel is about exploring new worlds.

But when we step back . . . take the broader view . . . maybe even look in the rear view mirror from Mir . . . or the shuttle. . . or soon the International Space Station . . . we see that space travel doesn't only change the view from our planet.

It changes the view of our planet.

The unique vantage point of space has taught us that the Earth is not an inanimate object.

When we change our perspective, we see that our planet is very much an interconnected living organism. It grows. It changes.

Think about it this way.

About 3/4 of the Earth's vegetation is in the Northern Hemisphere.

You can literally measure the concentration of oxygen and carbon dioxide.

In the spring, the oxygen goes up and the carbon dioxide goes down . . . as the photosynthetic process takes hold.

In the fall, carbon dioxide goes up and the oxygen goes down because there's less foliage.

The Earth is breathing.

There's a biological process. Biology makes oxygen.

Billions of years ago, Earth did not have the same oxygen content.

In fact, we believe that Earth and Mars were very much alike for the first billion years of existence.

Warm. Wet. Each had condensed atmospheres of carbon dioxide.

Today, Mars is dry, cold, with a very thin atmosphere of carbon dioxide.

Earth, today, is rich in oxygen with very little carbon dioxide.

The difference is life. It is biology.

Studying other planets reinforces this connection . . . that Earth is living and that it breathes.

That's why a bio-feedback signal is so vitally important. Because the Earth changes.

Sometimes nature makes it change . . . and now we know, based on sound science, sometimes human activity causes the change.

But no matter, those changes -- although sometimes far away and often subtle --
affect each and every one of us, where ever we live . . . even in North Carolina.

That's really what those students were learning from the satellite images they were pulling down off the Internet.

Think globally . . . act locally.

Perhaps the best example, especially in light of current events, of a global climate change that is having tremendous impact in local communities worldwide . . . is El Nino.

Not everyone sitting in their homes in North Carolina watching the evening news could possibly know exactly what El Nino is -- this phenomenon that was first observed, over 300 years ago, when fisherman noticed that the water got a little warmer and the anchovy population declined off the coast of Peru.

Even today, our best scientists don't yet know why every few years, trade winds in the Pacific weaken -- or relax -- and cause a shift in the ocean currents.

We don't know why every once in a while -- half a world away -- these trade winds shift and instead of driving a North/South current . . . the warm water in the ocean at the equator starts traveling due East.

We also have a sense that the frequency and the severity of this activity is going up.
Again we don't know why it happens.

We don't know if it is being driven entirely by human activity.

Perhaps, you might not even need to know exactly why this happens.

But to be a responsible parent, or business owner, or farmer, or policy maker . . . you have to know that it happens.

If you live in North Carolina or anywhere else, you must understand that there is a connection between the atmosphere, the ocean, the biosphere and modern humanity that can set off a series of phenomena with not only global . . . but with very much regional and local implications.

I come from Los Angeles, where you normally get 12 inches of rain.

One year there was such a severe drought that trees that have lived for over a century died. The next season, we got over 50 inches of rain.

And we have seen in recent days how this weather activity has caused tragic mud slides in California and tornadoes in Florida.

But you have to be concerned if you live in North Carolina, too. There is not a community that is immune.

Tourism in the Outer Banks is affected by the amount of rain fall and sea level changes causing beach erosion.

Climatic events like El Nino can affect the logging industry and the foliage around Asheville and the Appalachians.

Increased winter rains can impact North Carolina's agriculture and the price of food in the Research Triangle and southeast can go up.

And here's one that some people don't immediately think of -- insurance companies.
It is estimated that the 1993 El Nino event was responsible for $8 billion in damages.

The torrential downpours in some areas and the terrible droughts in others affected 39 crops in 33 countries.

Just think about how this variability in climate half way around the world affects everyone's life.

You can begin to appreciate just how crucial it is that we understand the forces of nature, and how to predict the impact of the forces of nature.

You can begin to appreciate just how on a global scale we understand situations like El Nino . . . and how on a local scale we understand the predictive impact on our economies and our families.

Now this isn't about tree-hugging. It's about the quest for knowledge that is so vital to a high-tech society and our future.

Think globally . . . act locally.

So let me briefly describe how we -- NASA, the university community, NOAA, and others
were able to work together to track El Nino.

We put up a series of three spacecraft.

The first measured ocean temperatures. NOAA -- the National Oceanic and Atmospheric Association -- has been monitoring those for some time.

A few years ago, we launched the second satellite called Topex Poseidon. We developed this satellite in partnership with the French.

It is providing the most precise measurements ever of ocean surface height. This new technology actually measures the ocean surface to within about two inches.

The third instrument is what we call the Scatterometer. It was launched on a Japanese satellite . . . again, because this is a global challenge.

The Scatterometer is a microwave device that measures the wind velocity and the wind direction on the surface of the ocean.

Correlating the measurements from these three spacecraft, scientists on a quest for knowledge were able to predict an El Nino condition.

Now keep in mind, that when we talk about weather forecasts, in 1998, the best we can do
is five days.

Initially, forecasting was limited to about a day. With the invention of the telegraph, it went up to two days.

Finally, with spacecraft and better data and better computers we were able to get that up to five days.

And still, sometimes they're not that accurate.

But this tracking of El Nino was done about 1/2 year in advance . . . perhaps the very first
seasonal weather prediction.

That's a monumental discovery.

Now the challenge is to determine from these forecasts if the El Nino occurrence will mean terrible downpours or severe droughts in different regions and locales in America and around the world.

Then after we determine that, we can get the information into the hands of North Carolina's farmers -- well in advance of the adverse weather -- so they can choose which crops will do better in which situation.

You will also want and need this information if you're operating a power plant . . .or running a business that relies on tourism . . . or if you're in the transportation industry.

And El Nino is but one example.

We're beginning to get some data that says there may be similar patterns and storm tracks to El Nino in the Atlantic as well.

Just think about storm tracks in the Southeast.

Just think of what could happen if the storm tracks change by a few hundred miles.

We're just beginning to understand this because this is brand new science. But you can see why predictive capability is so important.

Another example.

It appears that there are fewer Atlantic Ocean hurricanes in an El Nino year.

But we are also learning that the opposite effect of El Nino -- La Nina -- or the shift of cooling currents . . . seems to produce more hurricanes in the Atlantic that can hit North Carolina.

North Carolina has been hit pretty hard by storms in recent years.

But for each hour of advanced warning, millions of dollars and countless lives can be saved.

So it's vital that we can accurately predict what's coming.

And it's equally important that we gain more insight to find out if human activity is causing an increase in the frequency and the severity of these events.

Now, I'm not contending that the human species is doing this. We don't have enough information yet. There's still a lot we don't know about climate change.

But what I am saying is that there is enough data to indicate that the atmospheric carbon dioxide is going up.

And that potentially impacts forestry, farming, fishing, as well as climatic events like an El Nino.

So we ought to look into these issues, find an accurate scientific explanation, and then let the policy makers and the American people decide what should be done.

The point is . . . predict . . . prepare . . . and prevent.

But you need knowledge to do that.

And providing that knowledge is what we're about at NASA.

Because it is our goal at NASA -- hopefully within about 10 years -- to make seasonal to annual predictions.

And in 25 years -- to make annual to decadal predictions of climate, environment, atmosphere and oceans and land so we can better manage our resources for sustainable development . . . globally, regionally, and locally.

We are going to put up the most aggressive constellation of Earth-viewing spacecraft in the history of this planet. They are going to give a literal physical to the Earth.

This year we will launch the first of a series of satellites called the Earth Observing System (EOS).

The first mission should study how clouds affect the global climate and how sea surface temperature affects the atmosphere.

It should give us insight into how the frequency and severity of storms may change . . . including seasonal storms like the hurricanes that this area is susceptible to.

It should help us measure the condition of vegetation so we can understand how North Carolina's forests and farms respond to variability in climate . . . like the droughts or floods that can be caused by events like an El Nino.

And it should also give us more information about the productivity of the oceans which can potentially be of great benefit to local fisheries and businesses on the coast.

After we launch that spacecraft we will launch Landsat 7.

It should provide images of the land with about 30 yard resolution.

These kind of images have been extremely beneficial in helping us monitor the health and extent of forests and farm land.

In fact, our colleagues at EPA -- many of them working down the road at Research Triangle Park -- are working with some other federal agencies to use the images from our Landsat satellites to map the vegetation of the entire United States . . . and how it has changed over the last 20 years.

Landsat will be followed by still other spacecraft and instruments that will hopefully give us the capability I mentioned earlier -- the annual to decadal predictions and forecasts that will allow us to promote sustainable development in concrete, proactive ways.

Let me quickly talk about some of the scientific research that is already underway
just in this area.

At Duke University, researchers are looking into how North Carolina forest plots are responding to elevated carbon dioxide concentrations in the atmosphere.

We are trying to understand how much of that response could be detected remotely. And hopefully how entire regions can be monitored more efficiently from space.

Here at NC State, there are researchers using data from a

small satellite called SeaWifs.

This data gives us a better sense of the productivity of the ocean, which in turn, affects fish populations.

At UNC, there are researchers studying the chemistry of the stratosphere and how human influence is changing it.

There are also researchers trying to understand how local land use decisions can be seen from space both in this country and abroad.

We're also working with the agricultural community.

In Kansas, we help produce what we call the Green Report for commodity traders.

And farmers themselves -- wherever they live -- can use remote sensing to produce better yields.

From the images from space, we can begin to measure the moisture of the soil to know exactly how much irrigation water to add, or if we are adding too much.

We can begin to measure the condition of the crop to know exactly how much fertilizer to apply, or if we're adding too much.

We can begin to measure more precisely when to plant and harvest. Are we doing it too late, or too early.

And we can see if there's an infestation of pests lurking underground that could potentially destroy a crop . . . and in some cases we can even identify exactly what that pest is.

I'll give you an example.

In California, we're working with the multiple-billion dollar wine industry and using these kinds of images and technology to detect phylloxera . . . a pest that eats away at the roots of the vines.

We call it Grapevine Remote Sensing Analysis of Phylloxera . . . or GRAPES.

We're having great success because early on, you can only detect the presence of this pest from the air and from space.

From the higher vantage we recognize the plant stress initiated by the presence of these pests at InfraRed wave lengths that show color and light that is not visible to the naked eye.

I'm sure that there are pests that might be affecting crops here in North Carolina, too.

We can use this same technology to detect and mitigate their

impact.

Again, think globally . . . . and then think about how farmers or loggers operating locally
in North Carolina, at some point, will be able to go on the Internet and get this data to see what actions they should take and what decisions they should make.

Think globally . . . and then put all of this data -- hurricane warning, rainfall, ocean productivity -- put this data into the hands of the local business owners or the fisherman whose livelihood is the Outer Banks.

The point is, whether you're a farmer, or a business owner . . . or a parent . . .
to be a responsible member of society . . . you will need this knowledge.

You need to participate in the process -- just like those students pulling down the images from the Internet.

And our job at NASA is the pursuit of that knowledge.

Our job is developing and providing the tools needed to collect data in an open, balanced manner, thoroughly peer reviewed, and to make that data available on the Internet to anyone who wants it.

Our job is to work with you.

First, because as you all know -- North Carolina, is a world leader in research.

And second, and most important, because you can see that when it comes to the relationship between us and our planet . . . we're all stakeholders:

NASA . . . Research institutions . . . policy makers . . . mom and pop businesses . . .
giant industries . . . and every single family.

I began by talking about my visit to Maine and the students in this state participating in the EarthKam program.

Every visit I've been able to make to schools across the country, really brings home the challenge we face as we approach the dawn of the 21st century.

It goes to the very heart of this Emerging Issues Forum.

And it reminds us why it so important to think globally and act locally.

That challenge is preparing our children for the world, but also protecting the world for our children.

Ensuring that today's progress does not come at tomorrow's

expense.

Realizing once and for all, that we are doing a great injustice if we steal from the future to survive in the present.

The decisions we make and the actions we take today will have a profound impact . . .
and not just on that boy in Maine and the students in this state that have been participating in the EarthKam program.

Our decisions will influence their children and their children's children.

We must always remember that.

Because who knows?

Some day one of those students might grow up to be Governor of North Carolina.

Maybe she will even host a conference at her alma mater.

And maybe . . . if we remain committed to thinking globally and acting locally . . . at that conference she will talk about how her parents and grandparents came together . . . worked as partners . . . and helped us all better understand the partnership between the people and the planet.

Now let's get to work.
###